



Some technical aspects of a CALIOP and MODIS data analysis that examines near-cloud aerosol properties as a function of cloud fraction



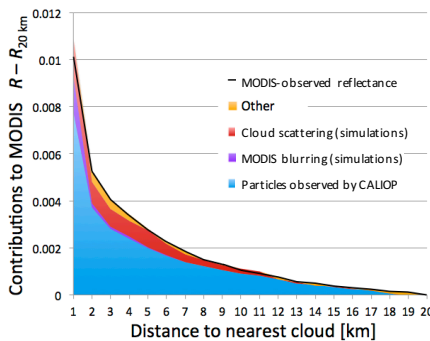
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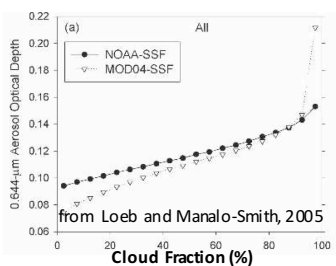
Summary

- CALIOP shows stronger near-cloud changes in aerosol properties at higher cloud fractions.
- Cloud fraction variations explain a third of near-cloud changes in overall aerosol statistics.
- Cloud fraction and aerosol particle size distribution have a complex relationship.

Earlier result: CALIOP data on near-cloud aerosols explained over 2/3 of reflectance increase seen by MODIS.



Other studies found: Aerosol optical depth (AOD) increases with cloud fraction (CF).



Question:

Does AOD dependence on CF explain near-cloud changes seen by CALIOP?

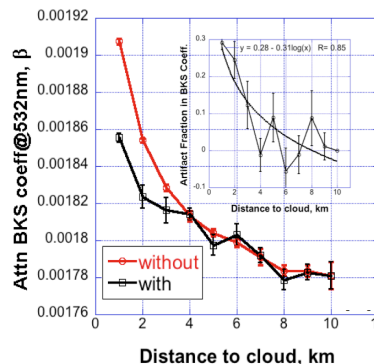
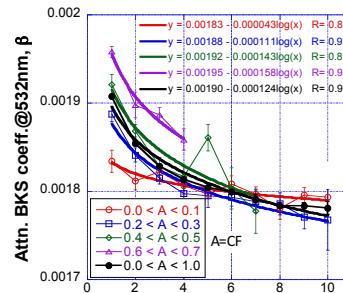
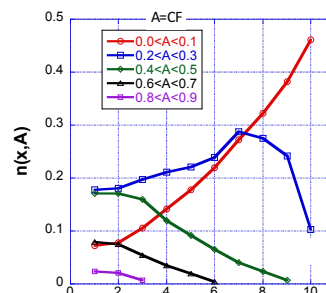
Multi-year CALIOP statistics near Azores show:

Most near-cloud data comes from areas with high CF, while far-from cloud data is from areas with low CF.

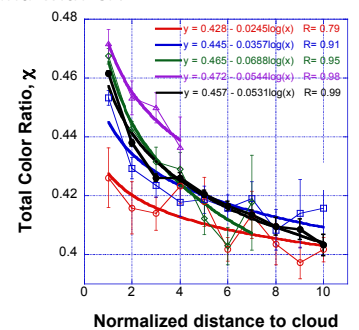
Lidar backscatter increases with CF.

It also increases near clouds even if CF is fixed.

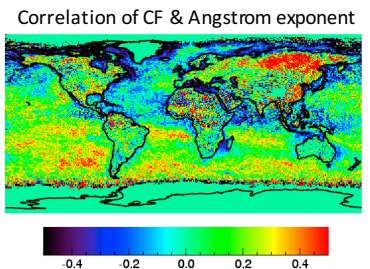
CF-variations explain $\approx 1/3$ of near-cloud increases in median backscatter.



CALIOP color ratio (related to aerosol particle size) behaves similarly to backscatter: it increases near clouds and with CF.



Relationship between CF and aerosol particle size shows regional variations in MODIS-based map below.



Positive correlation in CF & Angstrom exponent (AE): Particles looks smaller when CF is higher, as AOD increases more for small aerosols than for large ones.